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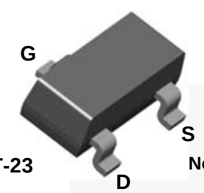
FAIRCHILD

January 2015

MMBFJ309 / MMBFJ310
N-Channel RF Amplifier

Description

This device is designed for VHF/UHF amplifier, oscillator and mixer applications. As a common gate amplifier, 16 dB at 100 MHz and 12 dB at 450 MHz can be realized. Sourced from process 92. Source & Drain are interchangeable.



SOT-23

Note: Source & Drain are interchangeable

Ordering Information

Part Number	Top Mark	Package	Packing Method
MMBFJ309	6U	SOT-23 3L	Tape and Reel
MMBFJ310	6T	SOT-23 3L	Tape and Reel

Absolute Maximum Ratings(1), (2)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
V_{DG}	Drain-Gate Voltage	25	V
V_{GS}	Gate-Source Voltage	-25	V
I_{GF}	Forward Gate Current	10	mA
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C

Notes:

1. These ratings are based on a maximum junction temperature of 150°C.
2. These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty-cycle operations.

Thermal Characteristics(3)

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Max.	Unit
P_D	Total Device Dissipation	350	mW
	Derate Above 25°C	2.8	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	°C/W

Note:

3. Device mounted on FR-4 PCB 36mm × 18mm × 1.5mm; mounting pad for the collector lead minimum 6cm^2.

Electrical Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
Off Characteristics							
$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	I_G = -1.0 µA, V_{DS} = 0		-25			V
I_{GSS}	Gate Reverse Current	V_{GS} = -15 V, V_{DS} = 0				-1.0	nA
		V_{GS} = -15 V, V_{DS} = 0, T_A = 125°C				-1.0	µA
$V_{GS(off)}$	Gate-Source Cut-Off Voltage	V_{DS} = 10 V, I_D = 1.0 nA	MMBFJ309	-1.0		-4.0	V
			MMBFJ310	-2.0		-6.5	
On Characteristics							
I_{DSS}	Zero-Gate Voltage Drain Current[(4)]	V_{DS} = 10 V, V_{GS} = 0	MMBFJ309	12		30	mA
			MMBFJ310	24		60	
$V_{GS(f)}$	Gate-Source Forward Voltage	V_{DS} = 0, I_G = 1.0 mA				1.0	V
Small Signal Characteristics							
$Re_{(yis)}$	Common-Source Input Conductance	V_{DS} = 10 V, I_D = 10 mA, f = 100 MHz	MMBFJ309		0.7		mmhos
			MMBFJ310		0.5		
$Re_{(yos)}$	Common-Source Output Conductance	V_{DS} = 10 V, I_D = 10 mA, f = 100 MHz			0.25		mmhos
G_{pg}	Common-Gate Power Gain	V_{DS} = 10 V, I_D = 10 mA, f = 100 MHz			16		dB
$Re_{(yfs)}$	Common-Source Forward Transconductance	V_{DS} = 10 V, I_D = 10 mA, f = 100 MHz			12		mmhos
$Re_{(yig)}$	Common-Gate Input Conductance	V_{DS} = 10 V, I_D = 10 mA, f = 100 MHz			12		mmhos
g_{fs}	Common-Source Forward Transconductance	V_{DS} = 10 V, I_D = 10 mA, f = 1.0 kHz	MMBFJ309	10000		20000	µmhos
			MMBFJ310	8000		18000	
g_{oss}	Common-Source Output Conductance	V_{DS} = 10 V, I_D = 10 mA, f = 1.0 kHz				150	µmhos
g_{fg}	Common-Gate Forward Conductance	V_{DS} = 10 V, I_D = 10 mA, f = 1.0 kHz	MMBFJ309		13000		µmhos
			MMBFJ310		12000		
g_{og}	Common-Gate Output Conductance	V_{DS} = 10 V, I_D = 10 mA, f = 1.0 kHz	MMBFJ309		100		µmhos
			MMBFJ310		150		
C_{dg}	Drain-Gate Capacitance	V_{DS} = 0, V_{GS} = -10 V, f = 1.0 MHz			2.0	2.5	pF
C_{sg}	Source-Gate Capacitance	V_{DS} = 0, V_{GS} = -10 V, f = 1.0 MHz			4.1	5.0	pF
NF	Noise Figure	V_{DS} = 10 V, I_D = 10 mA, f = 450 MHz			3.0		dB
e_n	Equivalent Short-Circuit Input Noise Voltage	V_{DS} = 10 V, I_D = 10 mA, f = 100 Hz			6.0		$nV/\sqrt{Hz}$

Note:

4. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2.0%

Typical Performance Characteristics

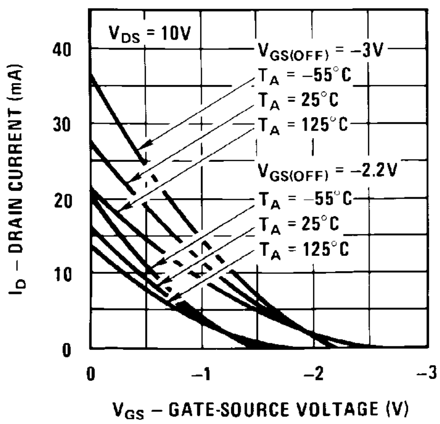


Figure 1. Transfer Characteristics

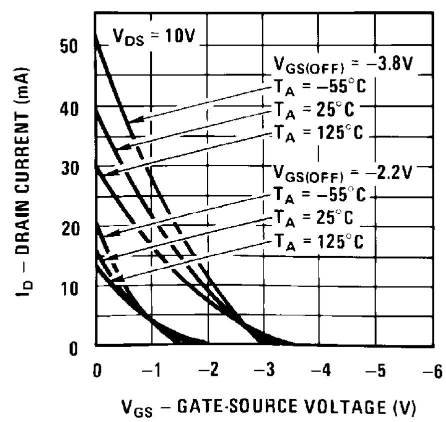


Figure 2. Transfer Characteristics

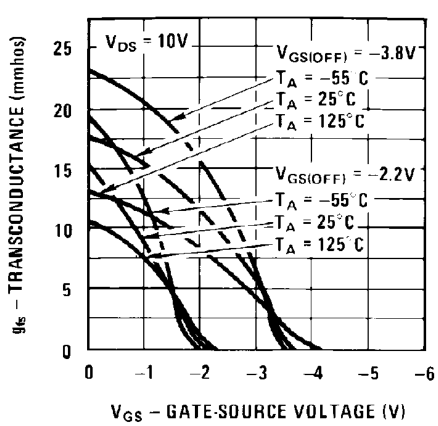


Figure 3. Transfer Characteristics

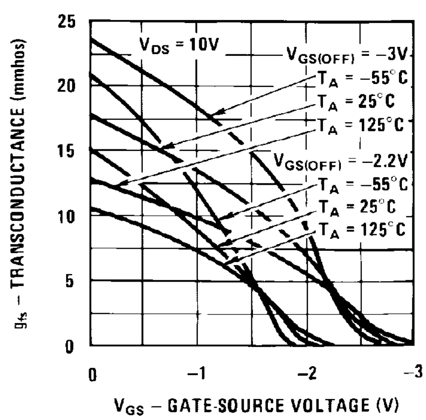


Figure 4. Transfer Characteristics

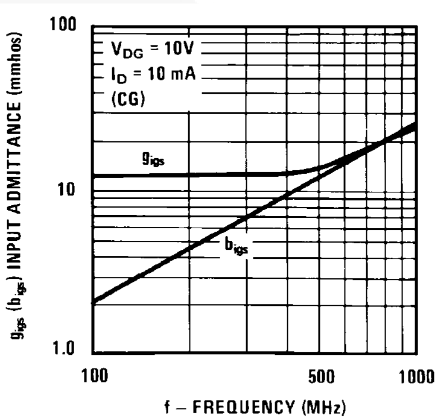


Figure 5. Input Admittance

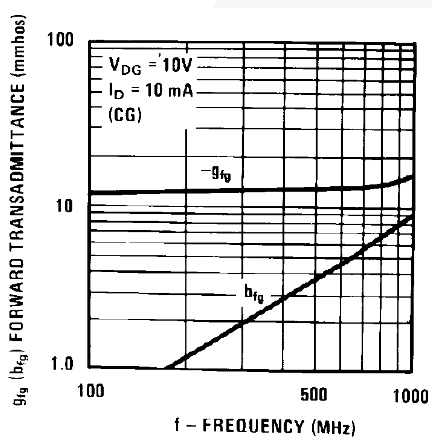


Figure 6. Forward Transadmittance

Typical Performance Characteristics (Continued)

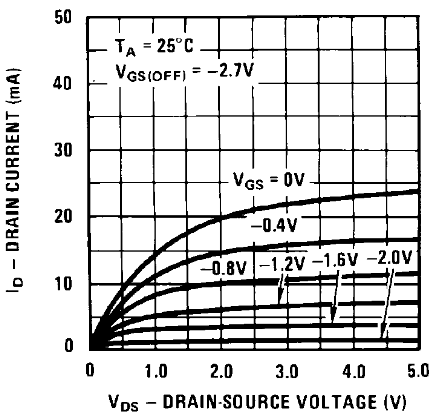


Figure 7. Common Drain-Source

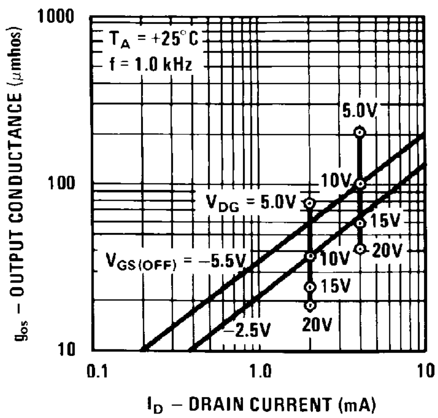


Figure 8. Output Conductance vs. Drain Current

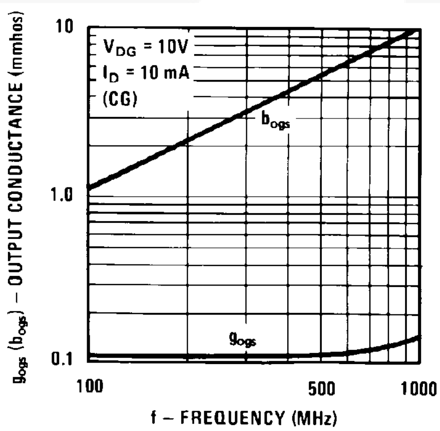


Figure 9. Output Admittance

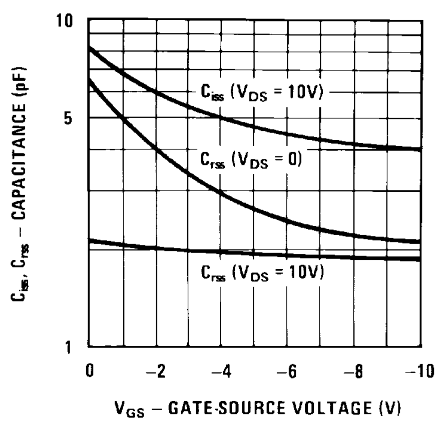


Figure 10. Capacitance vs. Voltage

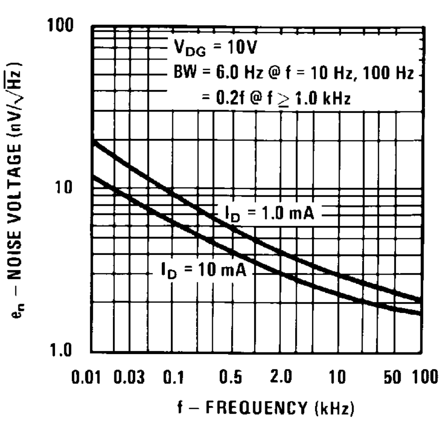


Figure 11. Noise Voltage vs. Frequency

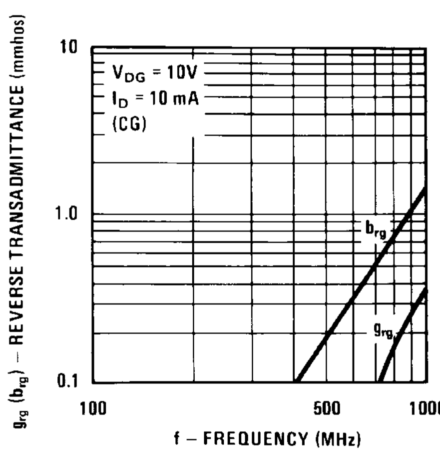


Figure 12. Reverse Transadmittance

Typical Performance Characteristics (Continued)

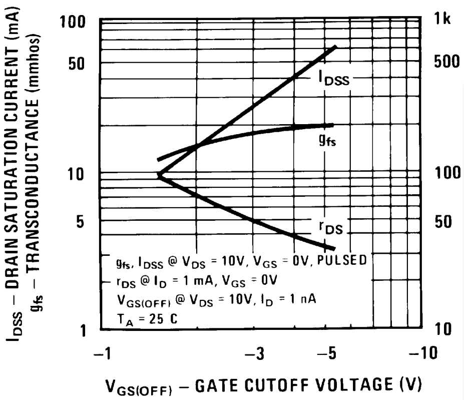


Figure 13. Parameter Interactions

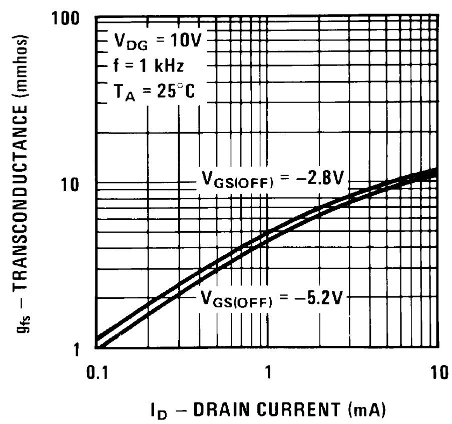


Figure 14. Transconductance vs. Drain Current

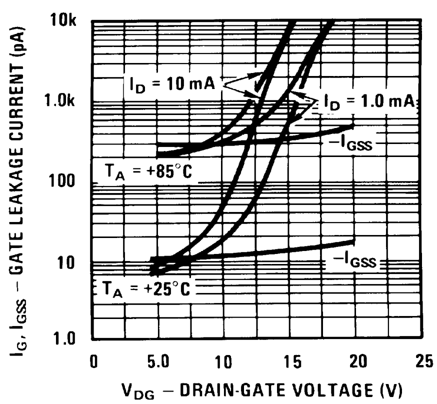


Figure 15. Leakage Current vs. Voltage

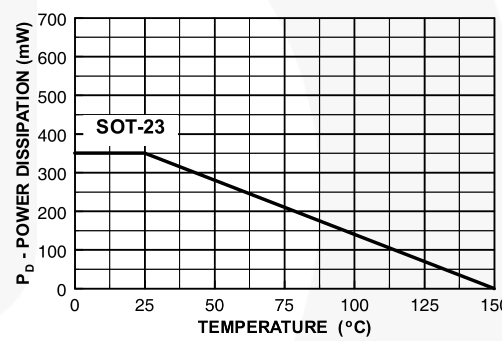
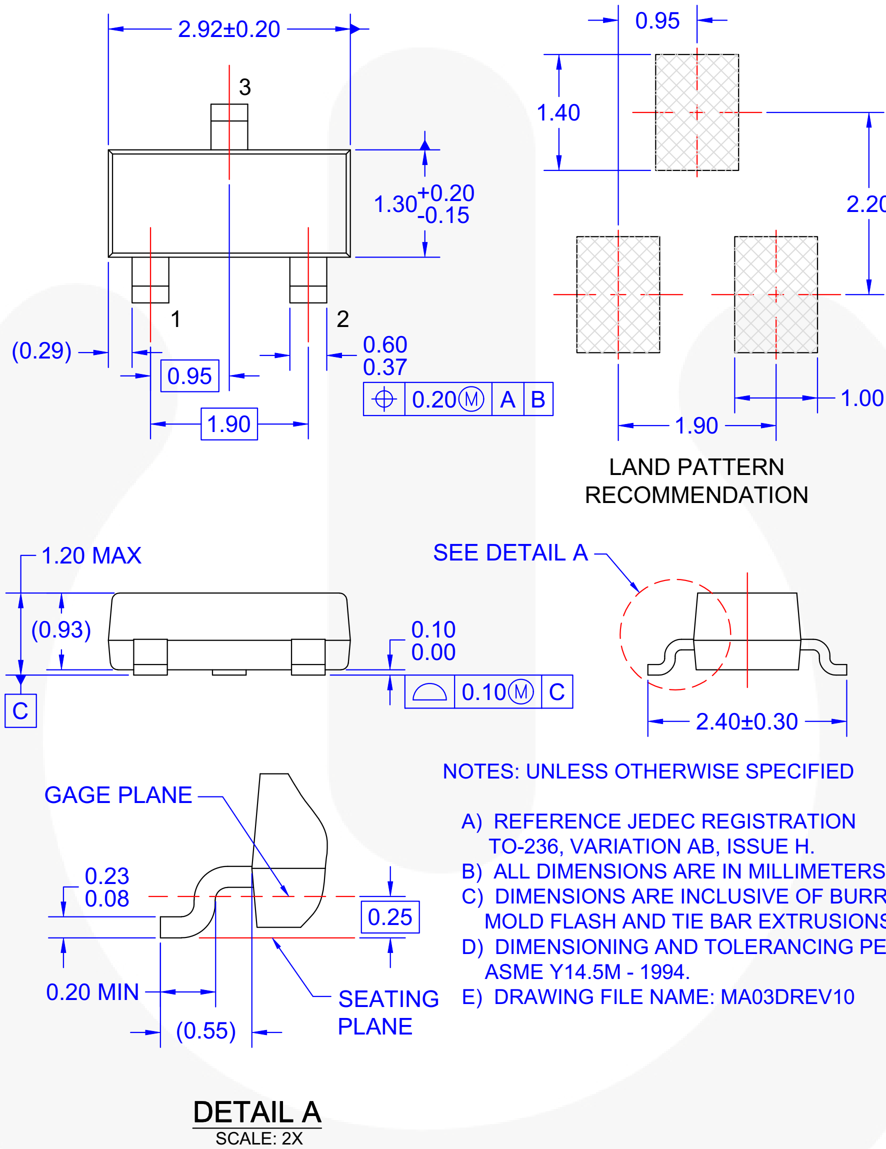


Figure 16. Power Dissipation vs. Ambient Temperature

Physical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
E) DRAWING FILE NAME: MA03DREV10

Figure 17. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I73

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